

Semiannual COMET Project Progress Report

University of Oklahoma/Cooperative Institute for Mesoscale Meteorological Studies

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NWS/AFWA/Navy Office: Hydrometeorological Prediction Center

Partners or Cooperative Project: Cooperative Project

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SECTION 1: PROJECT OBJECTIVES AND ACCOMPLISHMENTS

1.1 (To be completed by academic and forecaster partners) Please summarize progress on COMET-funded work during the last six months of the project.

Since June 1, 2001, resources for the project have been devoted to: (1) evaluating results from the first year of this project, (2) developing a new evaluation form for forecasters to submit during the 2001-2002 winter season, (3) preparing the project website for the second year of this project, (4) porting the processing for the Eta model to the IBM SP for faster output, (5) modifying the processing so that independent components run simultaneously on different nodes of the SP, and (6) preparing the processing system for the 12-km 60-level Eta output implemented on 27 November 2001.

During the previous six months, extensive work has gone into analyzing the results from the 2000-2001 winter season forecasts. These forecasts included both output from each of the six algorithms separately (Table 1) and an ensemble forecast of algorithm output.

Table 1. Algorithms Used in Experiment	
Algorithm Number	Author
1	Cortinas & Baldwin
2	Ramer
3	Baldwin & Contorno
4	Bourgouin
5	Czys et al.
6	Cortinas
7	Ensemble

Precipitation-type forecasts during the period of November 2000 through March 2001 from the ETA and the RUC were compared to surface observations taken during that same period and numerous verification statistics were computed. These statistics included probability of detection (POD), false alarm ratio (FAR), bias, threat score, Heidke and Kuipers skill scores. The analysis showed that all algorithms were skillful (as measured by the two skill scores). POD and FAR scores indicated that these algorithms also were able to forecast accurately both snow and cold rain ($T \leq 5^{\circ}\text{C}$); however, none of the algorithms were able to diagnose freezing rain and ice pellets accurately and consistently (Table 2).

We also evaluated the forecast quality of the ensemble forecast (Table 2 and Fig. 1). One interesting finding is that, in addition to algorithm 2, the ensemble forecast consistently had the "best" score for all of precipitation types, except ice pellets. Plotting the results on a reliability diagram also showed that the snow and cold rain probability forecasts were usually reliable, whereas freezing rain and especially ice pellets were significantly overforecast (Fig. 1). We will continue to investigate the use of the ensemble forecast and the sensitivity of the ensemble forecast to any one particular ensemble member.

To complete the second year of this experiment, the website for this project (<http://www.spc.noaa.gov/exper/ptax>) was updated and numerous procedures were established to provide forecasters, researchers, and the general public with real-time output. The real-time verification system on this website has been modified significantly and is nearly ready for use by forecasters. The web-based evaluation form has been modified this year to include more questions about the use of verification data by forecasters.

Table 1. POD and FAR ranges for algorithms 2-5.			
Precipitation Type	Measure	Range	Performance Order (excluding 1 & 6) ¹
Snow	POD	0.80 - 0.89	2,7,3,4,5
	FAR	0.03 - 0.08	5,(7,2),4,3
Rain (T ≥ 5°C)	POD	0.80 - 0.92	5,(7,2),4,3
	FAR	0.22 - 0.31	2,7,3,4,5
Freezing Rain	POD	0.32 - 0.54	2,7,4,5,3
	FAR	0.47 - 0.76	(2,7),5,4,3
Ice Pellets	POD	0.17 - 0.56	3,4,(5,7),2
	FAR	0.88 - 0.96	3,2,4,7,5

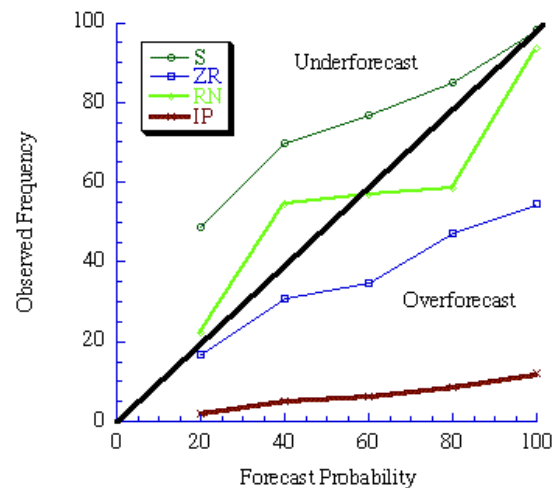


Figure 1. Reliability diagram for ensemble forecasts.

¹ Algorithm 1 was an algorithm based on geopotential height values at 1000, 850, 700, and 500 mb. If one of those values were missing, the algorithm was not used. Given the large number of forecasts without the 1000 mb data, this algorithm was evaluated separately. Algorithm 6 was not evaluated since running it required computing resources beyond that available at NCEP.

SECTION 2: RELATED ACCOMPLISHMENTS

2.1 (To be completed by academic partner) Please summarize any other work conducted by the University, which was a result of the COMET Outreach Program collaboration but was not directly funded by it (for example, presentation of seminars at NWS/DOT office, if these were not part of the original proposal).

The main university participant presented a brief description of the project to participants in the RFC-HPC Hydromet Course 02-1 in December 2001 during a seminar on precipitation-type forecasting.

2.2. (To be completed by forecaster partner) Please summarize any other work conducted by the NWS/DOT, which was a result of your collaboration with the university but was not directly funded by it (for example, seminars given by NWS/DOT forecasters at the university).

HPC Senior Forecaster Mike Eckert delivered a presentation on the use of the PTAX output during the 10th Great Lakes Operational Meteorological Workshop in Cleveland, OH (2-4 October 2001). The title of his presentation was "New Tools for Forecasting Winter Precipitation Type."

SECTION 3: SUMMARY OF BENEFITS

3.1 (To be completed by academic partner) Please list the benefits to the University resulting from the collaboration (new understanding of forecasting problems, exposure of students to operational forecasting, access to new observing systems, changes in course offerings, use of NWS/DOT personnel as resource, etc.).

As a result of this project, the university participants have gained a greater appreciation of time and information limitations within the operational forecasting environment. This information will ultimately help the university participants develop an efficient forecasting system for use in many types of operational settings. This project has also provided the university participants with additional personnel and computing resources at the HPC and SPC to help accomplish this research.

3.2 (To be completed by forecaster partner) Please list the benefits to the NWS/DOT office resulting thus far from the collaboration (promising new forecasting technique, heightened interest in research in the office, better understanding of new observing systems, potential new hires, use of university personnel as resource, etc.). Please be as specific as possible, particularly in regard to any improvements in forecasting operations resulting from this project.

Beginning in the winter of 2001--2002, HPC will be conducting a collaborative winter weather experiment with several WFO's in the eastern region. It is expected that the PTAX output will be of benefit during this experiment. Meanwhile, the HPC will

continue to use the PTAX output as guidance for its suite of winter weather risk products (93s, 94s, and 98s)

SECTION 4: PRESENTATIONS AND PUBLICATIONS

4.1. (To be completed by academic and forecaster partners) Please provide complete citations using the AMS bibliographic format for each thesis, dissertation, publication or presentation prepared as part of this COMET Outreach project.

Cortinas, J. V., M. Baldwin, and K. Brill, 2001: The Precipitation-Type Algorithm Experiment at the HPC and the SPC. Presentation, National Weather Association, October 19, 2001.

Cortinas, J.V., K. Brill, and M. Baldwin, 2001: The Precipitation-Type Algorithm Experiment at the HPC and the SPC: Year 1. Presentation, SPC and HPC Seminar, October 29, 2001.

Cortinas, J.V., K. Brill, and M. Baldwin, 2001: The Precipitation-Type Algorithm Experiment at the HPC and the SPC: Year 1. Presentation, Weather Analysis and Forecasting Issues in the Central US, December 1, 2001.

SECTION 5: SUMMARY OF PROBLEMS ENCOUNTERED

5.1 (To be completed by academic partner) Please describe problems encountered on the University side in the last six months and their resolution, if any.

The lack of sufficient computer resources to run one of the algorithms has caused us to run this algorithm only to predict cold ($T < 5^{\circ}\text{C}$) rain.

5.2 (To be completed by forecaster partner) Please describe problems encountered on the NWS/DOT side in the last six months and their resolution, if any.

Simply porting the PTAX processing to the SP was not sufficient to achieve a significant reduction in processing time over that of the workstation. The solution was to modify the scripts so as to distribute the processing over multiple nodes, with independent codes running simultaneously.